Purpose/Objective: To analyse the outcome of Carcinoma Cervix patients treated with CT based planning for both External beam treatment and Brachytherapy, with the objective of understanding the benefits afforded by image based optimised Brachytherapy.
Materials and Methods: Data of 60 patients from among 509 radically treated Cervix cancer patients treated with CT based treatment plans, between January 2011 to December 2012 were analysed for outcome. In view of extreme number of patients and limited resources, treating every patient with conformal RT is far from reality at our centre. Hence after the instillation of CT simulator at our centre, conventional pelvic EBRT portals were planned on CT images, making field adjustments ensuring target coverage, on the basis of soft tissue imaging information. Subsequently on similar lines CT imaging was used for Brachytherapy planning and isodose shaping to cover the cervix and uterus while keeping the normal organ doses within normal limits was attempted. CT optimization in Brachytherapy was to reduce OAR doses if found excessive with standard planning and Point A dose prescription. Subsequently dose volume optimization was attempted. But where the central disease was of small volume the point A dose was still kept at the standard prescription range if the OAR doses were acceptable.
Results: At a median follow up of 22 months (5-36mo), 9 patients in the CT planned group documented relapse. 4 patients had distant relapse and 5 had pelvic recurrence. Of the pelvic recurrences one patient recurred outside the initial treatment field (lower vaginal) and one patient documented progressive disease while on EBRT. The 3 other patients with true in-field recurrence had very advanced disease at presentation with bladder infiltration on imaging. Proper Brachytherapy application was not possible in 2 of these patients due to poor anatomy. There were no documented grade 2, 3 bladder toxicity. 6 patients had grade 2 rectal toxicity. During the same period there were 32 relapses and 16 isolated infield failures among the 258 CT planned patients treated with conventional 2D Brachytherapy. Also there were 22 grade 2 rectal toxicities in the patients treated with 2D brachytherapy.
Conclusions: CT imaging information could be used for EBRT and Brachytherapy planning with excellent clinical outcome in a setting with large patient numbers and limited resources. Technology adaptation to suit our conditions is important for improving outcome of cervix cancer patients in the developing world.

PO-1023

Impact of inhomogeneity correction for vaginal vault brachytherapy CT planning

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Purpose/Objective: To evaluate the dosimetric impact of implementing inhomogeneity corrections for vaginal vault brachytherapy and assess for correlations with patient related factors.
Materials and Methods: The plans of 48 consecutive patients treated with post-operative HDR vaginal vault brachytherapy using a single line source were evaluated. All patients had a planning CT scan with the vaginal cylinder in situ. The PTV consisted of the cranial 4 cm of vagina to a depth of 5mm, and any gas in the bowel was outlined over a standard number of CT slices and the volume measured and the diameter of the equivalent sphere estimated. The point doses for 3 randomly placed points in the PTV were measured and compared for a plan assuming a homogeneous tissue density equivalent to water (1g/cm^3)with another plan using Acuros ™ correction for tissue inhomogeneities. The 2-sample T-test for unequal variances (t) and the Pearson's correlation coefficient (r) with 2-tail significance testing at level of ≤ 0.05 were used to evaluate the differences and study the correlations between the 2 plans and patient related factors of: volume of gas in bowel, age, vaginal length and cylinder diameter. The differences in dwell times between the 2 plans were used to generate 2 subgroups: the 1st quartile and the 4th quartile.
Results: For the 48 patients in the study the median age: 67 yrs(22 - 82 yrs), and post-operative vaginal length: 11cm (8 - 13cm). The cylinder diameters used: 17% had 2.6cm, 19% had 3cm and 64% had 3.5cm. The median volume of gas: 9.58cm^3 (0.08 – 115.4cm^3) and the diameter for the equivalent sphere: 2.6cm (0.5 – 6cm). The Acuros correction resulted in a median increase in dwell times of 2.35%(2.0 – 3.52%).The percentage increase in dwell times correlated with the volume of gas (r=0.815; p=0.0000072) and the diameter of equivalent sphere (r=0.783;p=0.000037) but not with the vaginal length or cylinder diameter. On comparison of the 2 subgroups there were significant differences in volume of air (t=1.76;p=0.0013) and sphere diameter (t=1.72; p=0.00008) but not in vaginal length or cylinder diameter.
Conclusions: The use of inhomogeneity correction for vaginal vault brachytherapy will reflect more accurately the dosimetry at the time of the scan. It is significantly influenced by the volume of gas in the bowel which may not be constant throughout a fractionated course of treatment. Further studies on reproducibility are required.

PO-1024

Long-term results of daily HDR brachytherapy in the postoperative setting of endometrial carcinoma

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Purpose/Objective: To analyze the long term results of daily high dose-rate brachytherapy (HDRBT) in vaginal-cuff relapses (VCR) and toxicity in postoperative endometrial carcinoma (EC).
Materials and Methods: From January 2007 to September 2011, 153 patients with FIGO Stage 38-IA, 69-IB, 16-II, 13-IIIA, 2-IIIB, 10-IIIC1 and 5-IIIC2, were treated with HDRBT after surgery. Pathology: 136 /153 endometrioid adenocarcinoma and 17/153 other types. Radiotherapy: Group 1: 94/153

External beam irradiation (mean 45 Gy, range 44-50.4)+ HDRBT (2 fractions of 5-6 Gy); Group 2: 59/153 HDRBT alone (4 fractions of 5-6 Gy). Chemotherapy: 26 patients (4 cycles of carboplatin+paclitaxel). Toxicity evaluation: RTOG scores for bladder and rectum and the objective criteria of LENT-SOMA for vagina. Statistics: Chi-square and Fisher exact tests.
Results: Mean age (years): Group 1: 65 (40-88); Group 2: 62 (39-90). Mean follow-up (months): Group 1: 47.51 (8.64-82.149); Group 2: 48.08 (11.99-96.66). VCR: Only 2 patients in Group 1 (2.12%) and no patients in group 2(0%). Toxicity: Early problems in Group 1 appeared in 5.3 % in rectum (G1-2), 7.5% in bladder (G1-2) and 2.1% in vagina (G1); late problems appeared in 7.3 % in rectum (all G1-2 but 1 G3), 1.1% in bladder (G1) and 27.7% in vagina (all G1-2 but 1 G4). Group 2: Early: 6.7% in bladder (G1-2), 6.6% in vagina (G1-2). Late toxicity: Only vaginal problems were observed in 21.7% (G1-2). Significant differences were only found in rectal toxicity between Group 1 and Group 2 (p=0.004).
Conclusions: The present brachytherapy schedule for postoperative treatment of EC of 2 fractions of 5 Gy after EBI and 4 fractions of 5 Gy administered on a daily basis is a safe regime in terms of local control and toxicity. Similar results were found in a previous series with an increased number of fractions.

PO-1025

From 2D to 3D brachytherapy, changing clinical brachytherapy practice, a single institution experience

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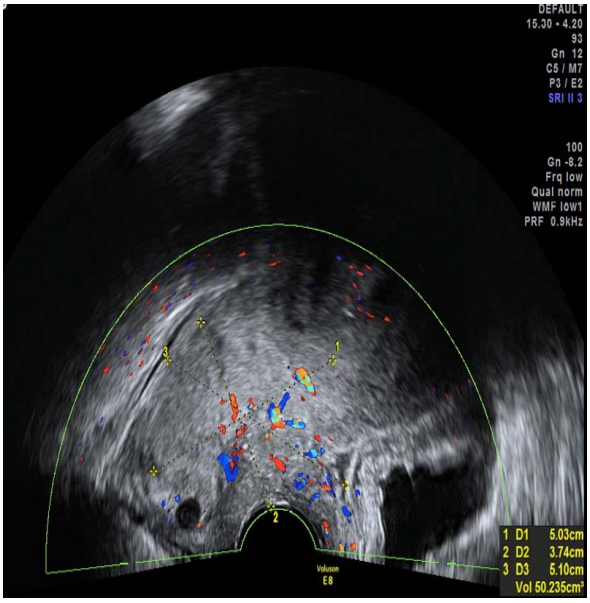
Purpose/Objective: In our Gynaecological Cancer Centre in Zagreb, Croatia, we treat annually with radical irradiation around 100 patients with cervical cancer. We start with chemo-irradiation (TD 45Gy/25fr with weekly Cisplatin 40mg/m2), and afterwards we continue with high dose rate (HDR) intracavitary brachytherapy (Iridium 192 source, Flexitron afterloading machine). We usually prescribe 4x7Gy to point A, and for many years we did Manchester planning based on X ray images with dose restrictions to organs at risk (OR) according to ICRU (International Commission on Radiation Units) 38 recommendations. After attending two gynaecological GEC ESTRO courses in 3D brachytherapy and an ESTRO funded visit to Department of Brachytherapy at the Institute of Oncology Ljubljana, our objective was to introduce 3D brachytherapy practice to our Centre. We realized that our main challenge was imaging since we have CT simulator and no MRI at our Centre. After learning the principles of GTV (gross tumour volume) and HR CTV (high risk clinical target volume) contouring on MR images, we tried to implement them to CT images. What helped greatly was our own clinical practice of trans-vaginal ultrasound (TV US) measurements of cervical tumour before and after chemo-irradiation.
Materials and Methods: To evaluate advantages of 3D brachytherapy planning over Manchester planning we did a pilot study on 10 patients with cervical cancer. After they received chemo-irradiation we performed our usual brachytherapy application with Rotterdam applicator (intrauterine tandem + ovoids). For each patient we obtained CT images and contoured HR CTV based on US measurements and gynaecological (GYN) GEC ESTRO working group recommendations. TV US offered width, height and thickness of the cervical tumour.



For each patient we did Manchester plan and 3D plan with dose prescription to point A or D90 HR CTV (minimum dose delivered to 90% of the respective volume) accordingly. Planning was done on Nucletron's Oncentra planning system. Dose restrictions to OR were according to ICRU points in rectum and bladder for Manchester planning and 2cc GEC ESTRO recommendations for rectum, bladder and sigma for 3D brachytherapy planning.
Results: With 3D planning we were able to increase prescription dose to D90 HR CTV, (especially in large tumours), while respecting restriction doses to OR. Unlike Manchester plan, we could also provide better protection of sigma. With Manchester planning, small tumour volumes had large doses in D90 HR CTV, but large tumour volumes were not as covered as in 3D planning.

Patient #	Planning	HR CTV mean volume (cc	D90 HR CTV (EQD2**)	Point A (EQD2)	2cc rectum (EQD2)	2cc bladder (EQD2)	2cc sigma (EQD2)
1.*	3D	72.0	64.3	83.4	54.8	67.6	52.3
	Manch.	72.0	55.8	64.1	52.5	58.2	52.3
2.	3D	43.0	67	82.6	69.3	90.1	52.6
	Manch.	43.0	63.3	77.2	61.5	88.8	56.3
3.	3D	26.0	80.2	73	65.5	67.1	74.2
	Manch.	26.0	81.8	73.1	62.4	72.3	74
4.	3D	32.0	96	90	57.7	65	59
	Manch.	32.0	92.3	83.9	61.6	70.7	59.5
5.	3D	36.0	88.8	88.1	66.7	88.5	64.4
	Manch.	36.0	79.8	83.9	62.5	83.7	63
6.	3D	66.7	84.6	101.7	67.3	88.5	67.2
	Manch.	66.7	71.1	83.9	60.5	79.1	58.3
7.	3D	39.5	85.8	85.3	64.9	78.5	73.9
	Manch.	39.5	79.3	83.9	61	72	71
8.*	3D	57.5	63.7	79.8	55.7	62.5	55.3
	Manch.	57.5	58	68.3	56	57.7	51.3
9.	3D	23.5	88.5	73.8	56	52	71.8
	Manch.	23.5	103	83.9	60	57.9	85.8
10.	3D	42.0	87.1	91.3	59.7	61.8	69.6
	Manch.	42.0	80.6	83.9	64.6	67	70.1

* patient with 2x8Gy prescription to point A preoperativly
**equivalent dose in 2Gy (Gray)

Conclusions: 3D brachytherapy planning offers better control of tumour coverage and protection of OR. The lack of MR image planning shouldn't be an obstacle for the introduction